HAND TOOL HAVING A LARGER OPERATION ZONE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a hand tool, such as a wrench, socket or the like, and more particularly to a hand tool having a larger operation zone to prevent slip of the workpiece.

2. Description of the Related Art

A conventional hand tool, such as a wrench, in accordance with the prior art shown in Fig. 9 comprises a mounting portion 61 including a plurality of arcuate protruding faces 62 and a plurality of receiving recesses 63 located between the protruding faces 62. In practice, each of the protruding faces 62 of the mounting portion 61 is rested on the flattened face 65 of the nut 64 to prevent slip of the nut 64.

However, each of the receiving recesses 63 has a corner 630 having a substantially right angle, so that the stress is easily concentrated on the corner 630, thereby breaking the structure of the wrench. In addition, the right-angled corner 630 is not easily manufactured during the working process. Further, the proportion of the depth T of each of the protruding faces 62 and the distance between the corner 630 of each of the receiving recesses 63 and the corner 630 of an adjacent receiving recess 63 is about 1: 2, so that each of the protruding faces 62 has a smaller depth. Thus, each of the protruding faces 62 and the

flattened face 65 of the nut 64 have a smaller contact area, so that the nut 64 easily slips during operation.

SUMMARY OF THE INVENTION

The primary objective of the present invention is to provide a hand tool having a larger operation zone to prevent slip of the workpiece.

Another objective of the present invention is to provide a hand tool, wherein each of the protruding faces of the mounting portion has a larger arc-shape, so that each of the protruding faces of the mounting portion is rested on the flattened face of the nut smoothly, thereby preventing the flattened face of the nut from being broken or worn out due to an excessive driving force.

A further objective of the present invention is to provide a hand tool, wherein each of the protruding faces of the mounting portion has a larger arc-shape, so that each of the protruding faces of the mounting portion is closely rested on the flattened face of the nut rigidly and stably so as to prevent slip of the nut.

A further objective of the present invention is to provide a hand tool, wherein by design of the smaller arc-shaped corner of each of the receiving recesses of the mounting portion, the driving stress applied on the mounting portion can be distributed efficiently, thereby preventing the mounting portion from being broken or worn out due to an excessive driving force.

In accordance with the present invention, there is provided a hand tool, comprising:

a main body provided with a mounting portion including a plurality of arcuate protruding faces and a plurality of receiving recesses located between the protruding faces;

wherein, each of the receiving recesses of the mounting portion has a smaller arc-shaped corner; and

the proportion of the depth of each of the protruding faces of the mounting portion and the distance between the corner of each of the receiving recesses and the corner of an adjacent receiving recess is equal to 1: 1.6.

Further benefits and advantages of the present invention will become apparent after a careful reading of the detailed description with appropriate reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a partially cut-away perspective view of a hand tool in accordance with the preferred embodiment of the present invention;

Fig. 2 is an exploded perspective view of the hand tool as shown in Fig. 1;

Fig. 3 is a top plan cross-sectional operational view of the hand tool as shown in Fig. 1;

Fig. 4 is a partially enlarged view of the hand tool as shown in Fig. 3;

Fig. 5 is a perspective view of a hand tool in accordance with another embodiment of the present invention;

Fig. 6 is a schematic operational view of the hand tool as shown in Fig. 5;

Fig. 7 is a perspective view of a hand tool in accordance with another embodiment of the present invention;

Fig. 8 is a perspective view of a hand tool in accordance with another embodiment of the present invention; and

Fig. 9 is a partially cut-away top plan view of a conventional hand tool in accordance with the prior art.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings and initially to Figs. 1-4, a hand tool, such as a wrench, in accordance with the preferred embodiment of the present invention comprises a main body 10, and a ratchet wheel 20 mounted in the main body 10.

The main body 10 includes a handle 12, and a driving head 14 mounted on one end of the handle 12. The driving head 14 of the main body 10 is formed with a receiving space 16 and has a bottom formed with an annular locking portion 15 for locking a snap ring 17. The driving head 14 of the main body 10 has a wall formed with a through hole 18 communicating with the receiving space 16.

The ratchet wheel 20 is mounted in the receiving space 16 of the driving head 14 of the main body 10 and has an outer wall formed with a plurality of ratchet teeth 21.

The hand tool further comprises a locking device 30 mounted in the through hole 18 of the driving head 14 of the main body 10 and including a locking pawl 31 engaged with the ratchet teeth 21 of the ratchet wheel 20, a screw member 33 secured in the through hole 18 of the driving head 14 of the main body 10, and a spring 32 urged between the locking pawl 31 and the screw member 33.

The ratchet wheel 20 has an inner wall formed with a mounting portion 22 for mounting a workpiece, such as a nut 40 (see Fig. 3) or the like. The mounting portion 22 includes a plurality of arcuate protruding faces 24 and a plurality of receiving recesses 23 located between the protruding faces 24. Preferably, the protruding faces 24 of the mounting portion 22 are arranged in an annular manner, and each of the protruding faces 24 of the mounting portion 22 is extended radially inward toward a center of the mounting portion 22. Preferably, the receiving recesses 23 of the mounting portion 22 are arranged in an annular manner, and each of the receiving recesses 23 of the mounting portion 22 is extended radially outward from the center of the mounting portion 22.

As shown in Fig. 4, each of the receiving recesses 23 of the mounting portion 22 has two sides each formed with a smaller arc-shaped corner 25. Thus, the smaller arc-shaped corner 25 of each of the receiving recesses 23 of the mounting portion 22 will simplify the milling or casting process of the mounting portion 22. In addition, by design of the smaller arc-shaped corner

25 of each of the receiving recesses 23 of the mounting portion 22, the driving stress applied on the mounting portion 22 can be distributed efficiently, thereby preventing the mounting portion 22 from being broken or worn out due to an excessive driving force.

In addition, each of the protruding faces 24 of the mounting portion 22 has a larger arc-shape. In practice, each of the protruding faces 24 of the mounting portion 22 is rested on the flattened face 41 of the nut 40 as shown in Fig. 3 to prevent slip of the nut 40. In such a manner, each of the protruding faces 24 of the mounting portion 22 has a larger arc-shape, so that each of the protruding faces 24 of the mounting portion 22 is closely rested on the flattened face 41 of the nut 40 rigidly and stably so as to prevent slip of the nut 40.

In addition, each of the protruding faces 24 of the mounting portion 22 has a larger arc-shape, so that each of the protruding faces 24 of the mounting portion 22 is rested on the flattened face 41 of the nut 40 smoothly, thereby preventing the flattened face 41 of the nut 40 from being broken or worn out due to an excessive driving force.

In practice, each of the protruding faces 24 of the mounting portion 22 has a depth equal to T, and the distance between the corner 25 of each of the receiving recesses 23 and the corner 25 of an adjacent receiving recess 23 is equal to L. The proportion of the depth T and the distance L is equal to 1: 1.6. Thus, by increasing the depth T of each of the protruding faces 24 of the

mounting portion 22, each of the protruding faces 24 of the mounting portion 22 and the flattened face 41 of the nut 40 have a larger contact area, so as to prevent slip of the nut 40.

Referring to Figs. 5 and 6, a hand tool, such as a socket 50, in accordance with another embodiment of the present invention has an upper end formed with a first mounting portion 51 and a lower end having an inner wall formed with a second mounting portion 52. The first mounting portion 51 has a structure the same as that of the mounting portion 22 of the main body 10 of the wrench, and has an inner wall formed with a through hole 53 and an outer wall formed with a plurality of arcuate protruding faces 55 and a plurality of receiving recesses 54 located between the protruding faces 55. The second mounting portion 52 has a structure the same as that of the mounting portion 22 of the main body 10 of the wrench, and includes a plurality of arcuate protruding faces 550 and a plurality of receiving recesses 540 located between the protruding faces 550.

Thus, as shown in Fig. 6, the first mounting portion 51 of the socket 50 is mounted in the mounting portion 22 of the main body 10 of the wrench, and the second mounting portion 52 of the socket 50 is mounted on the nut 40,

Referring to Fig. 7, a hand tool, such as a socket 50A, in accordance with another embodiment of the present invention has an upper end formed with the first mounting portion 51 and a lower end having an inner wall formed with a hexagonal recess 7.

Referring to Fig. 8, a hand tool, such as a socket 50B, in accordance with another embodiment of the present invention has an upper end having an inner wall formed with the through hole 53 and a lower end having an inner wall formed with the second mounting portion 52.

Although the invention has been explained in relation to its preferred embodiment(s) as mentioned above, it is to be understood that many other possible modifications and variations can be made without departing from the scope of the present invention. It is, therefore, contemplated that the appended claim or claims will cover such modifications and variations that fall within the true scope of the invention.